

What I claim is:

20. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of at least one aluminum polymer and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof;

wherein the ratio (active mass basis) of ammonium polymer to aluminum polymer is greater than  $1/20$ ; and wherein,

said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least approximately 500,000 to approximately 1,000,000; and

the ratio (active mass basis) of said ammonium polymer, having a molecular weight of at least approximately 500,000 to approximately 1,000,000, to said aluminum polymer is greater than  $1/60$ .

21. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of at least one aluminum polymer and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof,

wherein the ratio (active mass basis) of ammonium polymer to aluminum polymer is greater than  $1/20$ ; and wherein,

said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least approximately 1,000,000 to approximately 5,000,000; and

the ratio (active mass basis) of said ammonium polymer, having a molecular weight of at least approximately 1,000,000 to approximately 5,000,000, to said aluminum polymer is greater than  $1/150$ .

22. A process for clarification of water by chemical treatment, said process comprising:
- adding to the water an effective amount of at least one aluminum polymer and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof,
  - wherein the ratio (active mass basis) of ammonium polymer to aluminum polymer is greater than 1/20; and wherein,
  - said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least approximately 5,000,000; and
  - the ratio (active mass basis) of said ammonium polymer, having a molecular weight of at least approximately 5,000,000, to said aluminum polymer is greater than 1/150.
23. A process for clarification of water by chemical treatment, said process comprising:
- adding to the water an effective amount of at least one aluminum polymer and an effective amount of at least one polyacrylamide, or blends thereof, to coagulate particles and to form a flocculated suspension thereof,
  - wherein the ratio (active mass basis) of polyacrylamide to aluminum polymer is greater than 1/150.
24. The process of claims 20, 21, 22 or 23 wherein the residual soluble aluminum of the settled water is less than 0.2 mg/L.
25. The process of claims 20, 21, 22 or 23 wherein the IOC content of the settled water is less than 2 mg/L.
26. The process of claims 20, 21, 22 or 23 further including the addition of an effective amount of at least one aluminum salt or blends thereof.

27. The process of claim 23 wherein the polyacrylamide is selected from the class anionic, cationic or nonionic or combinations thereof.
28. The process of claims 20, 21, 22 or 23 wherein the alkalinity of the raw unclarified water is less than 50 ppm.
29. The process of claim 28 wherein the turbidity of the raw unclarified water is 20 NTU or less.
30. The process of claims 20, 21 or 22 wherein the ammonium polymer includes DADMAC.
31. The process of claims 20, 21 or 22 wherein the ammonium polymer includes Epi-DMA.
32. The process of claims 20, 21, 22 or 23 wherein the aluminum polymer includes polyaluminum hydroxychloride.
33. The process of claims 20, 21 or 22 wherein the ammonium polymer contains quaternized nitrogen.
34. The process of claim 23 wherein the polyacrylamide contains quaternized nitrogen.
35. The process of claims 20, 21, 22 or 23 that includes adding ozone to the water in a purifying process to remove TOC and/or DOC.
36. The process of claims 20, 21 or 22 wherein said ammonium polymer and said aluminum polymer are blended in sufficient proportion and quantity to remove algae from said water during clarification.

37. The process of claim 23 wherein said polyacrylamide and said aluminum polymer are blended in sufficient proportion and quantity to remove algae from said water during clarification.

38. The process of claim 26 wherein said aluminum salt and said ammonium polymer are blended in sufficient proportion and quantity to remove algae from said water during clarification.

39. The process of claim 27 wherein said aluminum salt and said polyacrylamide are blended in sufficient proportion and quantity to remove algae from said water during clarification.

40. The process of claim 35 wherein said aluminum salt, ozone and ammonium polymer or polyacrylamide are added in sufficient proportion and quantity to remove algae from said water during clarification.

41. A method for blending at least one ammonium polymer and at least one aluminum polymer, comprising:

suspending the ammonium polymer reaction with an acid other than an acid containing oxides of sulfur;

adjusting the pH of the ammonium polymer in aqueous solution to a pH of less than 6; and

combining the ammonium polymer solution with an aluminum polymer in a method that includes high shear.

42. A method for blending at least one polyacrylamide selected from the class of cationic polyacrylamides or nonionic polyacrylamides or combinations thereof and at least one aluminum polymer, comprising:

suspending an ammonium polymer reaction with an acid other than an acid containing oxides of sulfur;

adjusting the pH of the polyacrylamide in aqueous solution to a pH of less than 6;

and

combining the polyacrylamide solution with an aluminum polymer in a method that includes high shear.

43. The method of claim 41 wherein adjusting the pH of the ammonium polymer solution includes adjusting the pH to approximately  $4.25 \pm .25$ .

44. The method of claim 41 that includes adding at least one aluminum salt or blends thereof to the mixture of ammonium polymer and aluminum polymer solution such that the basicity of the total aluminum solution is less than 55%.

45. The method of claim 42 wherein adjusting the pH of the polyacrylamide solution includes adjusting the pH to approximately  $4.25 \pm .25$ .

46. The method of claim 42 that includes adding at least one aluminum salt or blends thereof to the mixture of polyacrylamide and aluminum polymer solution such that the basicity of the total aluminum solution is less than 55%.

47. The method of claim 41 or 42 wherein the basicity of the total aluminum solution is less than 45%.

48. The method for blending at least one aluminum polymer with a polyacrylamide comprising:

mixing, including high shearing, a solution of at least one aluminum polymer; and

adding at least one cationic or non-ionic polyacrylamide to the aluminum polymer at a high shear mixing point.

49. A method of storing a at least one chemical selected from the class of aluminum polymers, aluminum salts, cationic polyacrylamides, nonionic polyacrylamides or ammonium polymers or combinations thereof in solution, comprising:

storing the solution in an enclosed structure; and

adding an inert gas in the portion of the structure not containing solution.

50. The method of claim 48 wherein the inert gas comprises nitrogen.

51. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of an aluminum salt and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof; and wherein

said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least approximately 500,000 to approximately 1,000,000; and wherein the turbidity of the raw unclarified water is 150 NTU or greater.

52. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of an aluminum salt and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof,

said ammonium polymer or blends thereof includes at least one ammonium polymer

having a molecular weight of at least approximately 1,000,000 to approximately 5,000,000; and

wherein the turbidity of the raw unclarified water is 150 NTU or greater.

53. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of an aluminum salt and an effective amount of at least one ammonium polymer, or blends thereof, to coagulate particles and to form a flocculated suspension thereof,

said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least approximately 5,000,000; and

wherein the turbidity of the raw unclarified water is 150 NTU or greater.

54. A process for clarification of water by chemical treatment, said process comprising:

adding to the water an effective amount of an aluminum salt and an effective amount of at least one polyacrylamide, or blends thereof, to coagulate particles and to form a flocculated suspension thereof, wherein the turbidity of the raw unclarified water is 150 NTU or greater.

55. The process of claims 51, 52, 53 or 54 wherein residual soluble aluminum of the settled water is less than 0.2 mg/L.

56. The process of claims 51, 52, 53 or 54 wherein the IOC content of the settled water is less than 2 mg/L.

57. The process of claims 51, 52, 53 or 54 further including the addition of an effective amount of at least one aluminum salt or blends thereof.

58. The process of claims 51, 52 or 53 wherein the ammonium polymer includes DADMAC.

59. The process of claims 51, 52 or 53 wherein the ammonium polymer includes Epi-DMA.

60. The process of claim 54 wherein the polyacrylamide is selected from the class of anionic, cationic or nonionic or combinations thereof.

61. The process of claims 51, 52 or 53 wherein the ammonium polymer contains quaternized nitrogen.

62. The process of claims 51, 52, 53 or 54 that includes adding ozone to the water in a purifying process to remove TOC and/or DOC.

63. The process of claims 51, 52 or 53 wherein said ammonium polymer and said alum are blended in sufficient proportion and quantity to remove algae from said water during clarification.

64. The process of claim 57 wherein said aluminum salt and said ammonium polymer are blended in sufficient proportion and quantity to remove algae from said water during clarification.

65. The process of claim 62 wherein said aluminum salt, said ammonium polymer and ozone are added in sufficient proportion and quantity to remove algae from said water during clarification.

66. A process for removing algae from water by chemical treatment, said process comprising:

adding to the water an effective amount of at least one ammonium polymer or blends thereof, wherein said ammonium polymer or blends thereof includes at least one ammonium polymer having a molecular weight of at least 1,000,000.



67. The process of claim 66 further including the addition of an effective amount of an algacide to remove algae from the water.